# FISH PROPAGATION FOR FOOD.

## LETTER

OF

## PROFESSOR BAIRD,

RELATIVE TO

*An appropriation for the propagation of food-fishes in the rivers of the United States.*

FEBRUARY 8, 1873.—Referred to the Committee on Appropriations and ordered to be printed.

UNITED STATES COMMISSION, FISH AND FISHERIES,
*Washington, January* 10, 1873.

DEAR SIR: In order that you and the members of the committee may have some idea of what has been actually done with the sum appropriated during the last session for the increase of the useful food-fishes in the United States, I beg leave to inclose a brief statement for your information, reserving for my report to Congress, which is in an advanced stage of preparation, the details of my work.

In September last I estimated the sum of $15,000 as desirable for the prosecution of the work during the coming year. I did not, however, take sufficiently into consideration the amount to be done in regard to the shad; and, as an appropriation for the next fiscal year will not be available till the 1st of July, 1873, I respectfully request that the sum of $10,000 be placed at my command before that date, by an item inserted in the deficiency bill, or otherwise, to be expended immediately in the introduction of shad in the Mississippi Valley and the great lakes.

The spawning season of this fish in the Saint John's River, Florida, has already begun, and it will be almost entirely closed in the northernmost waters by the end of June, and, consequently, all the expenditure for this work must be made before the close of the present fiscal year.

For the details of the investigation in regard to the decrease of food-fishes, I would refer to my report to Congress. The result there indicated will, I think, be considered as amply warranting the expenditure.

Furthermore, in view of the importance of the subject and the expediency of accomplishing the results desired in the shortest possible time, I beg leave to suggest the addition of $5,000 to the estimate for operations other than those connected with the shad.

The estimates would, therefore, read as follows:

*In the deficiency bill, (or elsewhere:)*

For expenses of introducing shad into the western rivers and lakes ..... $10,000

*Sundry civil expenses bill:*

For propagation of food-fishes in the rivers and lakes of the United States ..... 20,000
For continuation of the inquiry into the causes of the decrease of the food-fishes of the coasts and lakes of the United States ..... 5,000
For preparation of illustrations of the report of the United States Commissioner of Fish and Fisheries ..... 1,000

It will, of course, be remembered that, under the law of Congress appointing a Commissioner of Fish and Fisheries on the part of the United States, he receives no salary.

Very respectfully, your obedient servant,

SPENCER F. BAIRD,
*Commissioner.*

Hon. JAMES A. GARFIELD,
*Chairman of the Committee on Appropriations,*
*House of Representatives, Washington, D. C.*

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*Summary of operations prosecuted in* 1872, *in the way of stocking the rivers and lakes of the United States with useful food-fish; addressed to the Hon. J. A. Garfield, chairman of the Committee on Appropriations.*

At a meeting of the Association of American Fish Culturists, and of State fish commissioners, held in Albany, in February, 1872, it was determined to make application to Congress for assistance in stocking the greater rivers and lakes of the United States with useful food-fishes, on the ground that, whatever the several States might be willing to do for themselves, respectively, they were not ready to enter upon any measures the benefit of which would inure partially, or perhaps exclusively, to the citizens of other States.

It was also believed that much remained to be done in the way of introducing the best varieties of foreign fish, such as might be especially suitable for certain waters to which our domestic species are not so well adapted, thus acting on the same principle as that by which the Agricultural Department takes measures to procure new and desirable kinds of foreign seeds and plants, and disseminates them throughout the United States. A committee was elected to carry out the wishes of the association; and Congress finally made an appropriation of $15,000 for this purpose, the disbursal of which was placed in my charge, as Commissioner of Fish and Fisheries. As the American Fish Culturists' Association had been so closely connected with the measures for obtaining the desired appropriation, I felt it my duty to ask their advice as to the initiatory steps to be taken in the enterprise; and, at my request, a special meeting was held in Boston in the beginning of June, at which the question was brought up as to the species of fish that should first be taken into consideration, and the measures most suitable for securing their multiplication. It was advised that shad, salmon, and white-fish be the kinds first attended to; and, after a very full and free interchange

of views and receiving many valuable suggestions, I proceeded to Eastport, in Maine, which served as my headquarters until October, both for the inquiry into the decrease of the food-fishes of the United States and the question of their multiplication.

The appropriation was not made until early in June, and was not available until the 1st of July; and there was, consequently, little time for doing much during the year in respect to the introduction of shad. I was so fortunate, however, as to engage the services of Mr. Seth Green, of Rochester, and Mr. William Clift, of Mystic Bridge, Connecticut; both experienced fish-culturists. Mr. Green, by permission of the fish commissioners of New York, obtained a large number of young shad from the State establishment near Albany, (some hundred thousands,) and carrying them west, placed a portion in the Alleghany River, at Salamanca, and another portion in the Upper Mississippi, at Saint Paul. A much larger number would have been used but for the fact that the season on the Hudson lasted only a few days after it was possible to authorize Mr. Green to undertake the work. The season for hatching shad in the Connecticut River being rather later than in the Hudson, Mr. Clift was able to obtain a large supply, through the kindness of the Connecticut commissioners, and accordingly proceeded with several million, to the West. Of these, a portion were planted in the Alleghany River, and another portion in the White River, at Indianapolis. With a view of determining the practicability of transporting young shad over long distances in mid-summer, (a problem already experimented upon successfully by Mr. Seth Green, by taking young fish from the Hudson to the Sacramento,) Mr. Clift started for the Rocky Mountains with the remainder of his fry, and, notwithstanding the intense heat, succeeded in reaching Denver with several thousands of living fish, which he placed in the headwaters of the Platte.

We have much reason to anticipate success in the experiment of stocking the Mississippi River with shad, since we know that the Alabama River has been stocked by the efforts of Dr. Daniel, by carrying impregnated eggs from Savannah across to its head-waters; and there are instances, which are detailed fully in my report, of their occurring in considerable numbers at the Hot Springs of the Ouachita; at Neosho Falls, Kansas; at the falls of the Ohio, at Louisville; and in the Wabash River. There is little or nothing to interfere with the anticipation that, with proper efforts, shad may swarm in the waters of the Mississippi Valley, including all the tributaries of the Gulf, in the course of five or six years, in numbers corresponding to those in the Potomac, Delaware, and other Atlantic coast streams generally. The experience of the State of Connecticut in this respect is a case in point. The supply of shad in the Connecticut River, for several years, had been greatly diminished as compared with its former usual abundance, owing to the reckless methods of fishing. A few years ago the commissioners of fisheries of Connecticut undertook the business of hatching out the shad, and have been turning out young fish, year by year increasing in numbers, until the aggregate, in 1871, amounted to about 50,000,000 and in 1872 to 91,000,000. The benefit of this action was satisfactorily exhibited in the spring of 1872. Immense schools of shad were met at sea, bound for the Connecticut River, and the number of fine, marketable fish actually taken in its vicinity was so great that they became a drug in the market, scarcely worth more than five or ten cents each. This condition of things was, of course, not very satisfactory to the fishermen nor the marketmen, who preferred larger profits with less trouble; but

the boon to the people and consumers generally cannot be overestimated.

I desire to commence operations in regard to the shad at a very early period during the year 1873 by impregnating the spawn and hatching out the young fish in all the Atlantic rivers; beginning, perhaps, with the Saint John's, of Florida, and proceeding, with the advancing season, to the streams farther and farther north, until the work can be closed on the Connecticut River. The young fish can be taken from the coast by the lateral lines of railroad to different points in the West, and introduced in hundreds of localities; and it is hoped that many millions of young fish may thus be started on their way to become the progenitors of an ultimate supply in the waters of the entire Mississippi Valley.

If authority be granted, similar efforts with regard to shad will be made on the great lakes, in continuation of the labors of the commissioners of New York and Vermont, by whom several thousands of young fish have been planted in the tributaries of Lake Champlain and Lake Ontario. The practicability of having shad in abundance in the great lakes, cut off from access to the sea, is yet to be proved; but an augury of success is drawn from the fact that, by reason of discoveries made very recently, partly in connection with the United States commission of fisheries, the waters in the deeper portions of these lakes have been found to abound with minute crustaceans, which are very similar to, if not identical with, those which form the chief sustenance of the shad, and also of the salmon, in the ocean.

As regards the salmon, time was available to act with more deliberation, so as to secure more definite results, the spawning season for the eastern fish, as is well known, being as late as the end of October or the beginning of November. The fact that nearly all the rivers of the United States which formerly abounded in salmon are now destitute of them, made it necessary, of course, to adopt measures for obtaining spawn in large quantity. Heretofore the only establishment in America where these could be purchased was the hatching-house belonging to the Canadian government, at Newcastle, in Ontario, not far from Toronto, and under the care of Mr. Wilmot. The price charged, however, of $40 (gold) per thousand was almost prohibitory; and, at any rate, the number that could be obtained at any price was too small to be of much value in the proposed experiment. Accordingly, I adopted three methods for procuring the desired supply, in which I was encouraged by the fish-culturists, at their meeting already referred to.

It is known to most persons that salmon come from the sea in early spring, and, entering the large rivers, pass high up to their headwaters, remaining there for several months before the business of spawning is begun. Fat and in good condition at first, they gradually become very poor and emaciated, until, in the breeding season, they are unfit for food. After the eggs are deposited, the salmon return to the sea, or, in some instances, proceed into the large lakes, and there recuperate for future operations, returning to the sea in early spring. Taking advantage of this habit of the fish, Mr. Charles G. Atkins, the former fish commissioner of the State of Maine, undertook, in 1871, the then untried experiment of securing the salmon on their first entrance into the river, and penning them up until the spawning season in the fall. The living fish were purchased from the fishermen, and, after remaining in the inclosure until the proper season, the operation of taking their spawn was entered upon.

His success in 1871 induced me to join with the commissioners of several of the States in giving to Mr. Atkins the means of carrying on

the work on a much larger scale; and this was prosecuted with such vigor that as many as six hundred sound, healthy salmon were secured. The subsequent operations were successfully conducted, and, as the result, Mr. Atkins now has in his hatching-house, at Bucksport, Maine, on the Penobscot, about a million and a half of salmon-eggs, which, at the prices charged by the Canadian government, would be worth $60,000 in gold; the actual cost, however, being something less than $8,000 in currency. Half of these eggs are the property of the United States.

The European salmon and that of Eastern North America are believed to belong to the same species, and the variety from the Rhine is considered as pre-eminent for the excellence of its flesh and for the sport it affords to the fisherman. Knowing that the German government was carrying on the fish-hatching establishment at Hüningen, (first started by the French, but subsequently, by the fortunes of the late war, falling, with the province in which it is situated, into the possession of their rival,) I applied to some friends connected with the German Fischerei-Verein to know upon what terms I could obtain a large number of eggs. I was promptly informed that, desirous of showing their appreciation of the American people, the German government would present to the United States 250,000 eggs, and that these would be ready, at the proper season, for transmission. Very grateful for this unexpected act of liberality, I ordered an additional half-million of eggs from the private establishment of Oberbürgomeister Schuster, at Freiburg, and engaged the services of Mr. Rudolph Hessel, an experienced fish-culturist of Germany, to accompany all these eggs to America, so as to be assured of the best attention for them on the voyage. These will probably leave Bremen about the 11th of the present month, and be here before its close. The magnitude of this transaction may be understood from the fact that the weight of eggs, in their packings, will not be less than 7,500 pounds.

Desirous of having a still larger number available for the experiment with the salmon, I engaged the services of Mr. Livingston Stone, a well known fish-culturist of New Hampshire, and directed him to proceed to California, with a view of securing eggs of the Sacramento species, which is different from that of the Atlantic coast, but, in its season, not inferior in eatable qualities. Although it was thought that the spawning season of the Sacramento salmon was about the same as that of the eastern fish, namely, toward the end of October, Mr. Stone lost no time in proceeding to the west coast, where he placed himself in communication with the California fish commissioners, and, partly by their advice, selected a suitable locality on the McCloud River, a tributary of the Upper Sacramento, where he established his hatching-house, and then proceeded to seine the fish, which were there in great abundance. To his surprise and disappointment, he found that the spawning season in the McCloud River was actually in the early part of September, and he was consequently unable to obtain more than twenty or thirty thousand eggs. These were shipped eastward, and the greater part of them are now in a thriving condition at the establishment of Dr. J. H. Slack, at Bloomsbury, New Jersey, in preparation for their transfer to the Susquehanna River.

The importance of the experiment with the Sacramento fish may be understood from the fact that their breeding-grounds on that river are in a region of very high summer temperature, reaching at noon, from 100° to 110° F. for a considerable period. Therefore, while the eastern salmon is hardly likely to thrive west of the Connecticut, or, at most, of

the Hudson, there is every reason to believe that the Sacramento fish can be introduced into nearly if not quite all the rivers of our Atlantic coast; and we have every confidence that the time is not far distant when we shall have in the Delaware, the Susquehanna, the Potomac, and the James an ample supply of this delicious fish, as well as in more eastern and northern waters.

I propose to place a large portion of the Penobscot River and German salmon eggs in the tributaries of the great lakes, as the fact of the occurrence of the natural food of the shad in our lakes in ample quantity applies equally well to the salmon.

It is likewise my intention to try the experiment of introducing the salmon and the shad into the Great Salt Lake of Utah. In this we have a body of salt water, according to Stansbury, of 291 miles in circumference, exclusive of offsets, and abounding in low forms of crustaceæ, and in dipterous larvæ, to an unheard-of extent, admirably fitted for feeding myriads of any fish that can live in it. That the purely fresh-water species of trout and *cyprinidæ* are all unable to survive therein is not to be wondered at, but there seems no good reason to suppose that salmon, shad, and alewives may not find a perfectly fitting resting-place, and one where they would in time multiply to an extraordinary degree, in consequence of the entire absence of the predaceous fishes, such as sharks, blue-fish, &c., which tend to keep down their numbers in the ocean. The experiment is worth trying, at any rate, and, if successful, it will add immeasurably to the food resources of the central portions of the West.

In addition to the genuine salmon ordered from Germany, a large number of hybrids between the salmon and the trout are expected. It has been established recently in Europe that such crosses are not only fertile to a considerable degree, but that the fish lose their instinct of wandering to the sea, and remain in the rivers throughout the year. Here they grow rapidly, more so than the perfect fish, and their flesh is highly distinguished for its excellence.

A beginning has also been made in regard to increasing the supply of white-fish in the lakes, and at present I have about three-quarters of a million eggs, in charge of Mr. N. W. Clark, at Clarkston, Michigan. A portion of these, as soon as they have developed sufficiently for the purpose, I propose to transmit to the commissioners of fisheries of California, for introduction into the waters of the Pacific coast; and, another year, to take measures for multiplying them largely throughout the great lakes. From its situation and size, Utah Lake appears well adapted for the introduction of white-fish and land-locked salmon, and I propose to try the experiment this season with both species.

I may say, in conclusion, that in all the work I have hitherto prosecuted I have had the hearty co-operation and concurrence of the fish commissioners of the several States, it being, in my judgment, the best policy to work with and in large part through them.

The fund appropriated by Congress is not sufficient to meet all the expenses of the business, especially that of hatching out and distributing the young fish, and I have therefore thought it best to limit my efforts to obtaining the eggs in sufficient quantities, and then to turn them over to the State commissioners, exercising the privilege of carrying the subject to its entire conclusion in the waters of such States as have not yet appointed commissioners.

The efforts of the United States, in reference to the introduction of useful food-fishes, should not be limited to the *Salmonidæ* already mentioned, (to which the various species of trout, salmon, white-fish, and

smelts belong,) and to the shad, as many other kinds yet remain for consideration. The land-locked salmon, the European char, and the smelt will be available for all ponds or lakes of a certain extent and temperature. In these they will pass the greater part of their time, running up into the tributaries or outlets to spawn. The great Danube salmon, which sometimes reaches a weight of one hundred pounds, would find a perfectly suitable residence in the Mississippi River and its tributaries, feeding on the worthless chubs, suckers, and catfish so abundant therein. The alewife also can be propagated to a much greater extent than at present. The sterlet, a kind of small sturgeon found in the Volga, in Russia, esteemed far beyond the turbot, will thrive in the Mississippi Valley and in the lakes. The gourami, an East India fish, can be placed to great advantage in the mill-dams, ponds, &c., of the South, thriving as it does in very warm water, and feeding entirely on vegetable matter. It attains a weight of twenty pounds or more, grows with great rapidity, and is unsurpassed in the excellence of its flesh. Other species could readily be mentioned, but I have stated enough to show the prospects before us in the way of increasing, to almost unlimited degree the food resources of our country, and in rendering the productiveness of our waters in this respect superior, acre for acre, to that of our land. Of course, time and expenditure of money will be required, but the larger the scale of operations, the sooner and more effectually the result will be accomplished.

There is also something still to be done by the United States in the way of extending the area of cultivation of lobsters, crabs, oysters, &c., if not by actual planting on a large scale, yet by making the necessary experiments, and supplying detailed instructions for the work. It is not impossible, indeed, that the Great Salt Lake, and other interior bodies of saline waters, may be made the nurseries of objects such as those mentioned above.

SPENCER F. BAIRD,
*United States Commissioner of Fish and Fisheries.*

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*Washington, January* 10, 1873.